

Appl. No. 10/003,908
Amdt dated October 22, 2003
Reply to Office Action of February 26, 2003.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listings of Claims:

Claim 1: (currently amended) A method of operating for removing a fluorine residue in a deposition process chamber, the method comprising:
placing a substrate in said process chamber;
depositing a film on said substrate, said depositing leaving a deposition residue on an interior surface of said chamber;
cleaning said deposition residue from said interior surface by creating a fluorine-containing plasma in said chamber, said fluorine-containing plasma leaving a fluorine-containing contaminant on said interior surface;
supplying an oxygen-containing gas into the process chamber;
supplying a hydrogen-containing gas into the process chamber;
producing a plasma of a mixture of the oxygen-containing oxygen-containing gas and the hydrogen-containing gas, so that the plasma reacts with the fluorine-containing contaminant residue to form a fluorine-containing material fluorine-containing gas; and
removing evacuating the fluorine-containing material fluorine-containing gas from the process chamber.

Claim 2: (currently amended) The method of claim 1, wherein the hydrogen-containing gas is selected from a group consisting of NH₃ and H₂.

Claim 3: (original) The method of claim 1, wherein the oxygen-containing gas is selected from a group consisting of N₂O, O₂ and air.

Claim 4: (currently amended) The method of claim 1, wherein producing the plasma exothermically generates H₂O, supplying and supplies heat to increase a rate of the reaction between the H₂O plasma and the fluorine-containing contaminant residue.

Claim 5: (currently amended) The method of claim 1, wherein producing the plasma produces an ion flux to an interior surface of the process chamber, so that the ion

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flux results in an ion-enhanced chemical reaction between the plasma and the fluorine-containing contaminant residue.

Claim 6: (currently amended) The method of claim 1, wherein producing the plasma generates a plurality of coordinately and electronically unsaturated radicals and ions that react reacts with the fluorine-containing contaminant residue.

Claim 7: (original) The method of claim 1, wherein the mixture of the oxygen-containing gas and the hydrogen-containing gas is 70 mol % N₂O/NH₃.

Claim 8: (original) The method of claim 7, wherein a flow rate of NH₃ into the process chamber is 1,500 sccm.

Claim 9: (original) The method of claim 7, wherein a flow rate of N₂O into the process chamber is 3,500 sccm or less.

Claim 10: (original) The method of claim 7, wherein producing the plasma uses a high frequency RF power of 3,000W, and a pressure of the process chamber is 2 Torr.

Claim 11: (original) The method of claim 1, wherein the mixture of the oxygen-containing gas and the hydrogen containing gas is 50 mol % N₂O/NH₃.

Claim 12: (original) The method of claim 11, wherein a flow rate of NH₃ into the process chamber is 1,500 sccm.

Claim 13: (original) The method of claim 11, wherein a flow rate of the N₂O into the process chamber is 3,500 sccm or less.

Claim 14: (original) The method of claim 11, wherein producing the plasma uses a high frequency RF power of 3,000W, and a pressure of the process chamber is 2 Torr.

Claim 15: (original) The method of claim 1, wherein the mixture of the oxygen-containing gas and the hydrogen containing gas is 52 mol % O₂/NH₃.

Claim 16: (original) The method of claim 15, wherein a flow rate of NH₃ into the process chamber is 2,000 sccm.

Claim 17: (original) The method of claim 15, wherein a flow rate of the N₂O into the process chamber is 2,170 sccm or less.

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Claim 18: (original) The method of claim 15, wherein producing the plasma uses a high frequency RF power of 2,000W, and a pressure of the process chamber is 3 Torr.

Claim 19: (original) The method of claim 1, further comprising supplying an inert gas to stabilize the plasma.

Claim 20: (original) The method of claim 19, wherein the inert gas is selected from a group consisting of He, Ne, Ar, and Kr.

Claim 21: (original) The method of claim 1, wherein the process chamber is a chemical vapor deposition chamber.

Claim 22: (new) The method of Claim 1 wherein the fluorine-containing material is a fluorine-containing gas.

Claim 23: (new) The method of Claim 1 wherein the hydrogen-containing gas is NH₃ and the fluorine-containing material comprises an ammonium fluoride.

Claim 24: (new) A method of operating a deposition process chamber, the method comprising:

placing a substrate in said process chamber;

depositing a film on said substrate, said depositing leaving a deposition residue on an interior surface of said chamber;

cleaning said deposition residue from said interior surface by creating a fluorine-containing plasma in said chamber, said fluorine-containing plasma leaving a fluorine-containing contaminant on said interior surface;

creating a plasma that generates H₂O and heat in said process chamber, said H₂O reacting with the fluorine-containing contaminant in the presence of said heat to form a fluorine-containing material; and

removing the fluorine-containing material from the process chamber.

Claim 25: (new) The method of Claim 24 wherein the fluorine-containing material is a fluorine-containing gas.

Claim 26: (new) The method of Claim 24 wherein the hydrogen-containing gas is NH₃ and the fluorine-containing material comprises an ammonium fluoride.